

REMARKS

Claims 9-12 and 15-16 are pending in this application. By this Amendment, claims 9-12 and 15-16 are amended and claims 5-8, 13-14 and 17-19 are canceled without prejudice to or disclaimer of the subject matter recited therein. No new matter is added.

In particular, method claim 9 is rewritten into independent form to incorporate the features of canceled independent product claim 5. Similarly, claim 10 is rewritten to incorporate features of canceled claim 6 and claim 11 is rewritten to incorporate features of canceled claim 7. Because claims 6 and 7 depended from canceled claim 5, which was incorporated into claim 9, claims 10-11 now depend from claim 9. Claim 12 is rewritten to incorporate features of canceled claim 8. Because claim 8 depended from claim 6, which is incorporated into claim 10, claim 12 now depends from claim 10. Claim 15 is rewritten to incorporate features of canceled claim 13. Because claim 13 depended from claim 5, which is incorporated into claim 9, claim 15 now depends from claim 9. Claim 16 is rewritten to incorporate features of canceled claim 14. Because claim 14 depended from claim 13, which is incorporated into claim 15, claim 16 now depends from claim 15. Thus, no new issues are raised.

In the Office Action, claims 5 and 13 are rejected under 35 U.S.C. §103(a) over U.S. Patent No. 6,284,048 to Van Bilzen et al. ("Van Bilzen") in view of U.S. Patent No. 5,444,217 to Moore; claims 6 and 14 are rejected under 35 U.S.C. §103(a) over Van Bilzen and Moore, further in view of U.S. Patent Application Publication No. US2002/0066412 to Yao et al. ("Yao"); claims 9 and 15 are rejected under 35 U.S.C. §103(a) over Van Bilzen and Moore, further in view of U.S. Patent No. 6,162,706 to Dutartre et al. ("Dutartre"); and claims 10 and 16 are rejected under 35 U.S.C. §103(a) over Van Bilzen and Moore, further in view of Yao and Dutartre. These rejections are respectfully traversed.

In the Office Action, claim 5 was considered a "product-by-process" claim and was admittedly given no patentable weight for the product-by-process features. This is improper. While the Patent Office bases patentability of product-by-process claim limitations on the product itself, the Patent Office must consider structure and properties that result from the process steps (MPEP §2113). Thus, structure implied by process steps must be considered where the "manufacturing process steps would be expected to impart distinctive characteristics to the final product" (*In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979). Moreover, "all words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). This admittedly has not been done with respect to the product claims or the method claims that rely on the product-by-process of susceptor formation.

In particular, the Patent Office misinterprets or ignores parts of the phrase "warped inverted U-shaped longitudinal sectional shape" in the claims by stating that "there is not [sic] limitation stating that the warped inverted U-shaped longitudinal sectional shape has to be in the center of the susceptor" and by relying on element 62 in Van Bilsen for this feature.

The phrase "warped inverted U-shaped longitudinal sectional shape" must be read in light of the specification and in its entirety. This has not been done. As shown, for example, in Applicants' Fig. 2A, the susceptor 2 is formed by heat-treatment to warp to an inverted U-shape with a warp amount of β along the longitudinal section. Thus, the "longitudinal sectional shape" in its entirety (not just a front or back surface or portion thereof) is shown to be warped to an inverted U-shape where both left and right sides as well as the top and bottom of the susceptor are warped as a whole relative to the center by a certain warp amount β .

However, for further clarity, Applicants revise the claims to make it explicit that the "entirety of the longitudinal sectional shape" is warped into the inverted U-shape.

The structure (element 62) of Van Bilsen referred to in the Office Action is a small recess on a far end of the susceptor for receiving post 64. Besides this section not even being in an inverted U-shape, as shown in Figs. 1-2 of Van Bilsen, the remainder of the susceptor back surface (as well as front surface) is horizontal and flat. Thus, the longitudinal sectional shape as a whole when viewed as a cross-section in its entirety is flat, with the recess being on only one end. Accordingly, the entire longitudinal sectional shape is neither inverted nor U-shaped as required.

As set forth in Applicants' background, slip dislocation during vapor phase growth is a problem with silicon epitaxial layer formation due to thermal stress. This is partially relieved by forming a pocket on a top surface of the susceptor. However, it does not sufficiently reduce the problem.

Applicants have found that this problem can be reduced by the method of claim 9. In particular, a susceptor of graphite coated with SiC that has been warped in its entirety in an inverted U-shape by heat treatment is selectively used to perform the vapor phase growth of a wafer. As a result of this heat-treatment warpage to the entire longitudinal section of the susceptor, the radius of curvature of the upper pocket 21 is changed to form a reduced height $D - \beta$, which is the distance between a bottom surface of the inner peripheral side part in the pocket and a rear surface of a silicon single crystal substrate supported on the susceptor. This is supported, for example, by Applicants' Table 1 where by reducing the distance through the warped inverted U-shaped longitudinal sectional shape, preferably to be less than 0.4 mm as recited in various dependent claims, slip dislocation has been found to be reduced.

Van Bilsen fails to appreciate the problems overcome by the subject matter of independent claim 9. Van Bilsen also admittedly fails to teach or suggest the specific method steps recited in independent claim 9. Moore, Yao and Dutartre, alone or in combination, fail to overcome deficiencies of Van Bilsen with respect to independent claim 9. While Dutartre

is relied upon for vapor growth formation, Dutartre fails to recognize the problem with slip dislocation occurrence, and fails to teach or suggest how to reduce such an occurrence.

Therefore, claim 9 and claims dependent therefrom would not have been obvious in view of Van Bilsen, Moore, Yao and/or Dutartre. Withdrawal of the rejections is respectfully requested.

In the Office Action, claims 5, 7, and 13 are rejected under 35 U.S.C. §103(a) over Japanese Patent Publication No. JP2000-355766 to Kukusai in view of U.S. Patent No. 5,088,697 to Murakami; claims 6, 8, and 14 are rejected under 35 U.S.C. §103(a) over to Kukusai in view of Murakami, further in view of Yao; claims 9, 11, and 15 are rejected under 35 U.S.C. §103(a) over to Kukusai in view of Murakami, further in view of Dutartre; and claims 10, 12, and 16 are rejected under 35 U.S.C. §103(a) over to Kukusai in view of Murakami, further in view of Yao and Dutartre. These rejections are respectfully traversed.

As discussed above, the previously used phrase "warped inverted U-shaped longitudinal sectional shape" refers to the shape of the entire susceptor in the longitudinal direction as now explicitly clarified in claim 9. The Office Action alleges that Fig. 2 shows a pocket formed in an inverted U-shape. However, both crevices 31 and 32 in Kokusai are taught to be formed by a Zagury process, which is a mechanical working, such as by machining. That is, the susceptor itself is not taught to be warped into an inverted U-shape longitudinal section, but remains flat and includes mechanically formed crevices 31 and 32. Although the susceptor may be subjected to heat treatment during any vapor growth formation, there is no teaching that the susceptor would warp into a U-shape or an inverted U-shape, if at all. If it warps upward into a U-shape, the top recess would deepen, likely resulting in excessive slip dislocation. Therefore, Kokusai does not inherently teach or possess properties, such as reduced slip dislocation occurrence, as achieved by the method of claim 9 using a warped susceptor as recited. Moreover, the result of the "warpage" is an

unexpected result. That is, one of ordinary skill in the art would not have expected that warpage during heat treatment when forming the susceptor could affect the occurrence of slip dislocation during vapor phase formation.

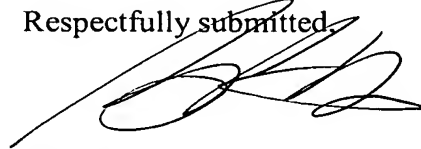
Accordingly, not only does Kokusai fail to teach a warped inverted U-shaped longitudinal sectional shape in its entirety as claimed, but Kokusai also fails to teach or suggest the specific method steps recited in independent claim 9.

Murakami, Yao and Dutartre, alone or in combination fail to overcome deficiencies of Kokusai with respect to independent claim 9. Therefore, claim 9 and claims dependent therefrom would not have been obvious in view of Kokusai, Murakami, Yao and/or Dutartre. Withdrawal of the rejections is respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 9-12 and 15-16 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Attachments:

Petition for Extension of Time
Request for Continued Examination

Date: February 4, 2008

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